

WHAT IS CLAIMED IS:

1. A navigation system utilizing sources of pulsed celestial radiation comprising:

displaceable receiver means for detecting signals generated by a plurality of sources of pulsed celestial radiation, each said source having a known position with respect to a reference point in an inertial reference frame;

timer means for generating time of arrival signals corresponding to time of detection of each said signal, said timer means being in communication with said displaceable receiver means; and,

processor means for computing navigational data based upon a calculated distance between said displaceable receiver means and said reference point and said known positions of said sources of pulsed celestial radiation, said processor means being in communication with said timer means.

2. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said processor means calculates a time offset between a signal pulse received at said displaceable receiver means and a calculated pulse time of arrival at said reference point.

3. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said reference point is the solar system barycenter.

4. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said displaceable receiver means is mounted on a displaceable receiving platform.

5. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said displaceable receiver means is mounted on a spacecraft.

6. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said processor means is in communication with a digital memory system.

7. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 6 wherein said digital memory system has stored therein a catalog of known sources of pulsed celestial radiation and respective position and pulse characteristics of each said source.

8. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said processor means is in communication with a transmitter for communication with a base station.

9. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 8 wherein said base station is land-based.

10. The navigation system utilizing sources of pulsed celestial radiation as recited in Claim 1 wherein said sources of pulsed celestial radiation are pulsars.

11. A navigational method utilizing a source of pulsed celestial radiation comprising the steps of:

- (a) receiving signal pulses from a plurality of sources of pulsed celestial radiation, each said source having known positional and pulse profile characteristics with respect to a reference point in an inertial reference frame;
- (b) generating time of arrival signals corresponding to time of reception of each said signal pulse;
- (c) calculating a pulse time of arrival at said reference point;
- (d) calculating a distance between point of reception of said signal pulses and said reference point; and,
- (e) calculating navigational data from said calculated distance and said known positional and pulse profile characteristics of said sources.

12. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 further comprising the step of storing positional and pulse profile data of said sources in a digital memory.

13. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 further comprising the step of transmitting said navigational data to a base station.

14. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 wherein step (d) includes the calculation of distance between said point of reception and the solar system barycenter.

15. The navigational method utilizing a source of pulsed celestial radiation further comprising the step of establishing a spacecraft and mounting a signal pulse detector thereto.

16. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 15 further comprising the step of transmitting telemetry and control data to said spacecraft.

17. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 further comprising the step of calculating an error estimate in said navigational data.

18. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 17 further comprising the step of comparing said error estimate to a set error threshold and returning to step (b) if said error estimate is greater than said error threshold.

19. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 wherein said step (c) is followed by a comparison of said pulse time of arrival at said reference point to a pre-calculated pulse time of arrival model.

20. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 19 further comprising the step of storing said pre-calculated pulse time of arrival model in a digital memory.



21. The navigational method utilizing a source of pulsed celestial radiation as recited in Claim 11 further comprising the step of blending said calculated navigational data with external sensor data measured by external sensors using a Kalman filter.